

DARWIN'S CONTRIBUTIONS TO PHILOSOPHY.

BY JOHN W. POWELL.

Many are the definitions of philosophy. If we wish not to define what is *true* philosophy, but simply to define the term in all its uses when referring to all times and all men, this definition will do: *Philosophy is the explanation of the phenomena of the universe.*

Now, the phenomena of the universe are embraced in many vast categories.

First, we have the constitution of the heavenly bodies, and their real and apparent motions to be explained. What are they, and how came they to be what they are?

Then we have the earth itself; its forms, its lands and seas, its mountains and valleys, its rivers and lakes, the winds which blow about it, the storms which fall upon it, the lightnings that flash athwart the sky, the thunders that roll among the clouds. What are all these things, and whence came they, and why are they? Again, in the constitution of the earth we find rocks with their minerals, and geologic formations with their fossils. What are rocks and minerals, formations and fossils, and whence came they?

Look at the innumerable forms of plants covering the earth with verdure—the whole vegetable kingdom on the land and on the sea; forests, mosses, and confervæ. Who shall explain the meaning of the phenomena of the vegetable kingdom?

The oceans teem with animal life; reptiles crawl over all the land; the hills and the valleys, the mountains and the plains, are all inhabited by beasts; and the air itself is populated. Who shall tell us of all the living things, and then explain life itself?

Turn to the contemplation of man, organized into tribes and nations; man possessed of innumerable languages; man engaged in arts and industries; man endowed with reason and will; man in search of moral principles to guide his conduct. Whence came this man, and whither does he go?

Among all tribes and nations of the globe, and in all times, men have sought to discover the whence, the how, and the why, of all things—the phenomena of the universe.

The explanation of the universe is philosophy.

The philosophies of the world may be classified as—

- I. Mythologic.
- II. Metaphysic.
- III. Scientific.

Mythology and science constitute the two grand systems of philosophy, but between them stands metaphysic philosophy as a stepping-stone from the former to the latter.

In the lower stages of society philosophy is purely mythologic. All savage and barbaric peoples explain the phenomena of the universe by a system of myths. A mythology is always a growth, and among every people there grows up by the employment of diverse and superficial analogies—curious suggestions—a body of mythic explanations which constitute its philosophy.

Among the Wintuns of California the world is three-storied. There is a world—a great chamber—above, and there is this world; and a world below. The waters fall from the world above because the sky, the floor of that upper world, leaks; and the waters come from the world below through the springs that issue from the flanks of the dead volcanoes of that land; so the waters from above and the waters from below meet and flow down the great Sacramento to the sea, where again they divide; the waters from above taking their way to their upper home, and the waters from below taking their way to the lower world.

The mountains were formed by the great mole-god, who crawled under the land and upheaved the mountain ranges that stand on either side of the Sacramento Valley. And so they explain all of the phenomena of the universe, with which they are acquainted, in a system of myths which constitutes the philosophy of the Wintuns.

Now such a system of philosophy, a mythology, is found in every savage and barbaric tribe of the world.

But there came a time in the history of mankind when some of the peoples changed their philosophy—their explanation of the phenomena of the universe—by changing their methods of reasoning.

ORIGIN OF METAPHYSIC PHILOSOPHY.

From three to two thousand years ago Europe, Asia, and Africa established a commerce in ideas—an exchange in philosophies—carried on by the navigation of the Mediterranean. During that and some previous time there were built on the shores of this sea many cities. Through the building of these cities, and through the industries and arts which sprang up therewith, society was reorganized, and placed upon a new basis—tribal society developed into national society—barbarism into civilization.

The peoples of these cities spoke diverse languages, and entertained diverse mythologic philosophies. Through the intercourse which sprang up between them each learned of the philosophy of the other, and the scholars of that day attempted to discover in all of these diverse mythologies a common body of truth upon the theory then widely accepted, that they had all sprung from a common source—a primitive philosophy itself the truth—and that all the philosophies then existing were degenerations therefrom. This line of investigation led to a curious result.

All of the mythologies of the cities of the Mediterranean were found to be baseless—each a fabric of poetic but superficial analogies. In the mental activity of that time many new philosophies were proposed, diverse and contradictory, and the wisest philosophers said, “How shall we know the truth?” And they endeavored to discover some criterion by which truth should be known. This resulted in the development of *formal logic* as a testing machine into which opinions were put for the purpose of sifting truth from error.

Now the machine called logic, the tool of the metaphysician, is curiously constructed. Its chief hypothesis is that man was primitively endowed with fundamental principles as a basis of reasoning, and that these principles can be formulated. These fundamental principles are supposed to be universal, and to be everywhere accepted by mankind as self-evident propositions of the highest order, and of the broadest generalization. These fundamental propositions were called *major* propositions. The machine, in formal logic, was a verbal juxtaposition of propositions with the major propositions at the head, followed by the minor propositions, and from this truth was supposed to flow.

This formal logic of the Aristotelian epoch has lived from that period to the period of science. Logic is the instrument of metaphysics, and metaphysic philosophy, in its multifarious forms, is the product of logic. But during all that time—2,000 years—no truth has been discovered, no error has been detected by the use of the logical machine. Its fundamental assumption is false.

It has been discovered that man is not endowed with a body of major propositions. It is found that in the course of the evolution of mind minor propositions are discovered first, and major propositions are reached only by the combination of minor propositions; that always in the search for truth the minor proposition comes first, and that no major proposition can ever be accepted until the minor propositions included therein have been demonstrated.

The error in the metaphysic philosophy was the assumption that the great truths were already known by mankind, and that by the proper use of the logical machine all minor truths could be discovered, and all errors eliminated from philosophy. As metaphysic methods of reasoning were wrong, metaphysic philosophies were false; the body of metaphysic philosophy is a phantasmagoria.

THE ORIGIN OF SCIENTIFIC PHILOSOPHY.

While metaphysic philosophers have been playing with their logical kaleidoscopes, another body of philosophers have been at

work gathering the materials for the philosophy of science. Their method is to collect facts and to discover their relations, and they accept no conclusions that are not reached by this method. All other conclusions they hold as undetermined or indeterminate.

And now must be given a definition of science. *Science is the discernment, discrimination, and classification of facts, and the discovery of their relations of sequence.* This is a simple statement, but for its full comprehension a little illustration may be necessary.

A savage hears the voice of his fellow-man, he hears the voice of the beast, and of the bird; he also hears the noise of the thunder, and he supposes that the noise is a voice. In these cases he *discerns* noises, but he does not *discriminate* one noise from the other, and supposes them all to be voices, and that the noise of the thunder is the voice of the Thunder Bird. To understand facts we must not only discern, but discriminate.

The next step in the progress of science is classification. Having discerned and discriminated facts, they must be classified—all those of like nature thrown together. All noises made by living beings for conveying intelligence may be grouped into one class and called voices; all noises made by explosions grouped in another class; and so, as we go on discerning, discriminating, and classifying, we collect the materials of philosophy.

But this is not all of philosophy. Facts have genetic relations. If one thing is done something else will follow, and the highest function of scientific philosophy is to discover the order of succession of phenomena—how phenomena follow phenomena in endless procession, how every fact has had its antecedent fact, and every fact must have its consequent fact. This part of science is called *evolution*, and by this expression scientific men mean to be understood that phenomena go on in endless consequences, and that every act has been preceded by some other act, and that every act will be followed by some other act; that the causes of all of the phenomena of the universe that we wish to explain in a system of philosophy run back into the infinite past; that the consequences of all of the

phenomena which we may now observe in the universe will run on into the infinite future. This is evolution.

The statement now given of the three great systems of philosophy is perhaps sufficient for our purposes this evening, and it remains for us to point out the part contributed to scientific philosophy by Darwin, whom we mourn to-night.

When Darwin rose as a light in the scientific world, scientific philosophers had already discovered that the philosophic method of research should include the discernment, discrimination, and classification of facts. At that time the scientific men of the world were engaged chiefly in the collection and arrangement of facts. To some extent they were engaged in discovering their relations of sequence. Important and interesting sequences had been discovered in the vast realm of astronomy; other interesting sequences of facts had been discovered in the realm of geology; some interesting sequences of facts had been discovered in the realm of human history. In the realm of biology, in plant and animal life, the order of succession of facts, the method of evolution, had not been discovered; yet many men were thinking on this subject, many men searching for the method and course of biologic evolution. The facts relating thereto were partly known, and the course and laws of biologic evolution were dimly discerned.

It remained for Darwin to demonstrate the laws of biologic evolution, and the course of the progress of life upon the globe. This he has done in a manner so masterly that there lives not in the world a working biologist, a scientific man engaged in this field of research, who has not directly or indirectly accepted his great conclusions, and the larger body of biologists have accepted them directly.

Let us now go back to the statement that prior to the time of Darwin, scientific men engaged in researches relating to vegetal and animal life were occupied chiefly in the discernment, discrimination, and classification of facts.

Botanists and zoölogists were engaged in describing species, and

classifying species, and this did not always enlist the highest talent: and naturalists had become wearied with discussions over minute differences and obscure resemblances, the origin and meaning of which were not understood.

The discovery, largely made by Darwin, of the laws of succession, or genesis, gave to this department of scientific research a wonderful impetus, and since that day thousands of men have sprung up throughout the civilized world to take part in biologic research.

In this field the greatest talent of the latest time is absorbed. The philosophy of biology satisfies the reason. In the universe of life, system is discovered, and biologists see visions of the origin of living beings and dream dreams of the destiny of living beings.

Had philosophers discovered that the generations of living beings were degenerating they would have discovered despair. Had they discovered that life moves by steps of generations in endless circles—that what has been is, and what is shall be, and there is no progress, the gift of science to man would have been worthless.

The revelation of science is this: Every generation in life is a step in progress to a higher and fuller life; science has discovered *hope*.

Darwin demonstrated what others vaguely believed or dimly saw: The course and methods of biologic evolution. Darwin gave hope to philosophy.

The universe of phenomena may be classed in three great categories.

I. Physical.

II. Biologic.

III. Anthropologic.

Physical phenomena may be thrown into three categories: 1. Molar or mechanical physics; 2. Stellar or astronomical physics; 3. Molecular physics.

Biologic phenomena may be classed as: 1. Vegetal; 2. Animal.

Anthropologic phenomena may be classed as: 1. Sociologic; 2. Philologic; 3. Philosophic; 4. Psychologic.

To the discovery of the methods and course of physical evolution, *i. e.*, the order of succession in physical phenomena, many great men have contributed. Among these, Newton stands pre-eminent.

The discovery of biologic evolution, *i. e.*, the succession of phenomena in vegetal and animal life, is in like manner due to the researches of many men, but among these Darwin stands pre-eminent. By his discoveries the discoveries of all other biologists have been correlated and woven into systematic philosophy. The methods and course of anthropologic evolution have yet to be systematized. Important discoveries have been made, but this portion of philosophy is yet inchoate.

WORKING HYPOTHESES.

But Darwin's investigations have not ended research or completed philosophy. He brought scientific men to the frontiers of truth, and showed them a path across the border. Yet more than this he did. He pointed out one of the fundamental methods of research. Before his time philosophers talked about deductive methods and inductive methods. Darwin has taught us that both are fruitless.

Deductive methods are the logical or metaphysical methods which have been already described, by which men arrived at conclusions from general principles supposed to be innate in the human mind. The vanity of these methods has already been characterized.

Inductive methods have found their best expression in the Baconian philosophy. By inductive methods men are to collect facts, unbiased by opinions, or preconceived theories. They are to gather the facts, put them together, arrange and combine them to find higher and still higher generalizations.

But there are facts and facts—facts with value, and facts without value. The indiscriminate gathering of facts leads to no important discoveries. Men might devote themselves to counting the leaves on the trees, the blades of grass in the meadows, the grains of sand on the sea shore;—they might weigh each one, and measure each

one, and go on collecting such facts until libraries were filled, and the minds of men buried under their weight, and no addition would be made to philosophy thereby. There must be some method of selecting, some method of determining what facts are valuable, and what facts are trivial. The fool *collects* facts; the wise man *selects* them.

Amid the multiplicity of facts in the universe, how does the wise man choose for his use? The true scientific man walks not at random through the world making notes of what he sees; he chooses some narrow field of investigation. Within this field he reviews what is already known and becomes conversant with the conclusions already reached. He then seeks to discern more facts in this field, and to make more careful discriminations therein, and then to make more homologic classifications; and, finally, more thoroughly to discover the complexity of sequences.

If he attain to success in doing all this his investigations are always suggested by some hypothesis—some supposition of what he may discover. He may find that his hypothesis is wrong, and discover something else; but without an hypothesis he discovers nothing. A scientific man taking up a subject reviews the facts that are known, and imagines that they lead to conclusions that have not yet been reached by others. His imagination may lead him quite astray, yet he follows it, and says "Now if this be true, then there must be certain yet undiscovered facts," and he seeks for them. He may find that which he seeks, or he may find something quite other. If he be an honest thinker, a true philosopher, it matters not to him. He substantiates his hypothesis or constructs a new one. If such hypothesis leads to many new discoveries scientific men accept it, and call it a working hypothesis, and if it still leads on to discovery scientific men call it a theory; and so working hypotheses are developed into theories, and these theories become the fundamental principles, the major propositions of science, the widest generalizations of philosophy.

Sometimes the inductive method—the Baconian method—is said

to have been modified or improved by the addition of the method by working hypotheses, and then modern scientific methods are said to be inductive. With this understanding, it may be said that the deductive methods of metaphysics have been supplanted by the inductive methods of science. It would, perhaps, be better to say that deductive and inductive methods have been superseded by the method of working hypotheses.

Working hypotheses are the instruments with which scientific men select facts. By them, reason and imagination are conjoined, and all the powers of the mind employed in research.

Darwin, more than any other man, has taught the use of working hypotheses. Newton and Darwin are the two great lights of science—the Gemini in the heavens of philosophy; stars whose glory is the brightest of all.

There be good folk in the world who love mythologic and metaphysic philosophy—one or both. In the ears of such the praise of Darwin is not sweet music. Let me beg of such who may be here to consider that we come to-night to praise our dead, and to tell of our love for the man who gave us hope. You and I cannot contend over an open grave, and in my soul I find no cause for angry contention elsewhere. Every man's opinions are honest opinions—his opinions are the children of his own reasoning, and he loves his offspring.

When I stand before the sacred fire in an Indian village and listen to the red man's philosophy, no anger stirs my blood. I love him as one of my kind. He has a philosophy not unlike that of my forefathers, though widely separated from my own, and I love him as one near akin.

Among civilized men I find no one who has not a philosophy in part common with my own; and of those smaller portions of our philosophies which are not alike I see no cause why anger should be kindled between us thereby. They and I are bound together by the same cord of honesty in opinion.

In Darwin's writings I find no word of reproach. Denunciation

and ridicule, greater than any other man has endured, never kindled a spark of hatred in his breast. Wrapped in the mantle of his philosophy he received no wounds, but lived with and loved mankind.

Let us not gird science to our loins as the warrior buckles on his sword. Let us raise science aloft as the olive branch of peace and the emblem of hope.

DARWIN'S WORK IN ENTOMOLOGY.

BY CHARLES V. RILEY.

Charles Robert Darwin was one of the original members of the London Entomological Society, of whom only six are yet living. He always took the keenest interest in the science of entomology, and drew largely from insects for illustrations in support of the theory with which his name will forever be associated. Indeed, I have the authority of my late associate editor of the *American Entomologist*, Benjamin Dann Walsh, who was a classmate of Darwin's, at Cambridge, that the latter's love of natural history was chiefly manifested, while there, in a fine collection of insects; so that, as has been the case with so many noted naturalists, Darwin probably acquired from the study of insects that love of nature, which, first forever afterward, inspired him in his endeavors to win her secrets and interpret aright her ways!

Though he has left no descriptive or systematic work of an entomological character, yet his writings abound in important facts and observations anent insects, and no branch of natural science has more fully felt the beneficial impulse and stimulus of his labors than entomology. Indeed, the varying conditions of life in the same individual or species; the remarkable metamorphoses; the rapid development; the phenomena of dimorphism and heteromorphism; of phytophagic and sexual variation; the ready adaptation to changed conditions, and consequent rapid modification; the great prolificacy and immense number of individuals; the three distinct-